

New Species of North American *Anomala*

(Scarabaeidae: Anomalinae)

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During revisionary study of the species of *Anomala* of America north of Mexico the following seven species were discovered to be new. All of the new species are apparently from relatively small geographic areas, and at least two or three are from very limited relictual habitats.

***Anomala diabla*, new species**

Holotype male.—Medium brown, head and clypeus red-brown, pronotum with large central red-brown macula extending to base, enclosing paler area medio-basally, elytra with narrow complete outer margin and sutural interval red-brown, this extending forward around scutellum and along base; scutellum almost median in hue between ground color and maculation. Thoracic sternites finely, not densely pilose. Protibiae tridentate; larger protarsal claw simple; larger mesotarsal claw finely but rather deeply cleft well back from apex. Antennal club slightly longer than stem. Clypeus trapezoidal, more than twice as wide as long; sides moderately divergent, broadly and strongly reflexed marginally; suture slightly depressed; disc of clypeus together with triangular area of front notably flattened, coarsely, irregularly punctate (more reticulate under higher magnification). Vertex with dense, fine, laterally elongate punctures. Pronotum evenly arcuate laterally, broadest near middle; anterior angles distinct, almost square; posterior angles broadly rounded; punctures moderately fine, not dense, but becoming more so laterally; basal bead fine, complete. Elytra slightly broader behind middle; striae slightly grooved, regularly, finely punctate, the punctures darker, particularly toward suture; subsutural interval markedly widest, multipunctate basally; other intervals subequal, 4th and 6th with scattered punctures; striae becoming irregular laterally. Pygidium punctate, punctures similar to those of pronotum but more irregular. Length, 9 mm.

Holotype male, TEXAS, DEVIL'S RIVER, near DEL RIO, 25 May 1932 (CAS); one male paratype, Texas, Eagle Pass, 2 June 1923 (Howden).

Holotype placed in the collection of the California Academy of Sciences and the paratype in the collection of Henry Howden.

The paratype is remarkably similar to the holotype, except that the larger mesotarsal claw is simple, and the elytral striae are more roughly punctate.

Named for the river where the type specimen was collected. The species superficially resembles *cavifrons*, but is without the elongate clypeus and carinate clypeal suture. It also has distinctly tridentate protibiae. These characters, with the simple protarsal claw, distinguish it from the

somewhat similar *delicata*, and some specimens of *undulata*, with which it might be confused.

***Anomala eximia*, new species**

Holotype male.—Head, pronotum and scutellum dark red-brown-black, elytra straw-colored; margins, punctures, and two vague irregular bands at middle before apex brown-black. Venter with sparse, moderately long pale pilosity. Mesocoxal separation moderate, about width of tarsal segment. Protibia without external tooth, terminal tooth moderately long, terminal articulated spine small, inconspicuous. Larger protarsal claw finely cleft near middle, upper ramus small, spine-like, closely appressed; larger mesotarsal claw finely cleft near apex. Metatibia as long as femora, moderately surate. Clypeus subrectangular, about twice as wide as long; sides slightly divergent, broadly, strongly reflexed; anterior face thick, vertical, rounded under to small exposed labrum; suture a little depressed; disc of clypeus together with triangular flattened area of head shallowly punctorugulose. Antennal club somewhat longer than stem. Pronotum slightly arcuate behind, about same width at base as at middle, then more strongly arcuate to square anterior angles; posterior angles broadly rounded; discal punctures rather coarse, irregular, contiguous to separated by 1–2 diameters, not becoming larger nor more dense at sides; basal bead very fine, entire. Elytra widest about middle; strial series very irregular, formed by individual punctures intermixed with short and long foveate groups of punctures; intervals scarcely distinct, but 2nd and 4th broader, 2nd very irregularly multipunctate, 4th with uniseriate row of scattered punctures. Pygidium finely rugose with sparse, moderately long pilosity. Length, 7 mm.

Holotype male, 8 male paratypes, FLORIDA, HIGHLANDS CO., ARCHBOLD BIOLOGICAL STATION, at Malaise Trap, 12–19 June 1969, R and J Matthews, Collrs. (UGA).

The Holotype is deposited in the collection of the U. S. Museum of Natural History, with paratypes in the collections of the University of Georgia and the author.

The species varies in size from 6.5 to 7.5 mm. The clypeus commonly has the sides parallel or even slightly convergent basally. The elytral sculpture and coloration is quite variable and the two irregular dark bands are sometimes lacking.

This is the second small species from Florida that has the protibiae lacking an external tooth, the other being *exigua* (Schwarz), however, while the similarity is interesting this species is not close to *exigua*, but belongs in the *binotata* series.

***Anomala hardyorum*, new species**

Holotype male.—Pale straw-colored; clypeal margin, anterior and posterior pronotal margins, sides of scutellum and elytral suture very narrowly reddish-brown; pronotum and elytra immaculate but variably pale due to irregular sclerotization. Thoracic sterna moderately pilose. Midcoxae narrowly separated. Anterior tibiae bidentate, lateral tooth not prominent, formed by excavation to terminal tooth; terminal articulated spine large and prominent; larger protarsal claw narrow,

barely perceptibly thickened basally, cleft deep, at about middle, with upper ramus fine, spine-like, much shorter than lower ramus. Metatibia much shorter than femur, barely longer than first 3 tarsal segments. Antennal club thin, slightly asymmetrical, notably longer than stem. Clypeus trapezoidal, more than twice as wide as long; strongly reflexed at margins; anterior face steeply oblique, then rounded beneath to narrow edge of exposed labrum; clypeofrontal suture flat at sides, depressed medially; front of head broad, subrectangular; both clypeus and front finely rugosely punctate. Pronotum widest at base, very broadly subangulate before middle, sides straight posteriorly, barely arcuate anteriorly to nearly square anterior angles; posterior angles obtuse, narrowly rounded; discal puncturation very fine with punctures separated by up to 3-4 diameters; basal bead fine, entire, depressed below discal plane. Elytra broadest near middle; 10 primary striae very weakly or not at all grooved, indicated by small punctures, each in a larger depression, these contiguous in a row or separated and irregular; subsutural interval slightly broader, multipunctate anteriorly, thinning posteriorly and punctures scarcely reaching apex; 4th interval substriately punctate much of length; 3rd, 5th and 7th intervals narrower but irregular, very slightly costate; micropunctures generally distributed over elytra. Pygidium with large, shallow, irregular punctiform depressions becoming finely rugose in part. Length, 9 mm.

Female.—Similar to holotype, but with pygidium much more finely and sparsely punctate; protibiae strongly bidentate with lateral tooth prominent; antennal club heavy, subequal to stem; larger protarsal claw evenly terminally cleft, upper ramus as large as and longer than lower ramus.

Holotype male, CALIFORNIA, IMPERIAL CO., 3 mi. NW GLAMIS, 12 April 1969, A. Hardy, (Hardy Collection); Allotype, same data, 23 April 1970, Hardy & Pritchard, (Hardy Collection); 93 males, 8 females, same data, 3 April to 5 May, 91 males, 10 females, same except various stations nearer Glamis, various dates between 26 March and 4 May.

Holotype, allotype and paratypes placed at California Academy of Sciences; paratypes in the collections of California Department of Agriculture, University of Arizona, Dave Carlson, J. M. Cicero, Alan Hardy, H. F. Howden, G. F. Nelson, Ron Mc Peak, and the author.

Male paratypes varied from 7 to 10 mm, the females from 7 to 9 mm; both were sometimes a little darker, sometimes with faint pronotal clouding of a darker hue. The size and length of the upper ramus of the larger protarsal claw was quite variable in both sexes.

Named in honor of Alan and Wanda Hardy who have made many trips to the Glamis dunes, studying the remarkable relict fauna and flora of the area.

***Anomala imperialae*, new species**

Holotype male.—10 mm. Light brown; with head, clypeus, anterior and posterior margins of pronotum, broad sutural and lateral margins of elytra and some elytral punctures dark brown. Beneath strongly pilose with mixture of short and moderately long hairs. Mesocoxae narrowly separated. Protibiae tridentate; larger pro- and mesotarsal claws simple. Antennal club distinctly longer than stem. Ligula

with more than normal number of erect setae but not enough to be confused with penicillate ligula of much smaller *Leptohoplia*. Clypeus trapezoidal, more than twice as wide as long; sides moderately divergent; margins narrowly, abruptly reflexed; discally with fine transverse rugae and small scattered punctures; front more strongly, irregularly rugosely punctate. Pronotum almost evenly arcuate at sides; anterior angles almost square, a little rounded; posterior angles broadly rounded; discal punctures very fine, shallow, becoming much larger and very irregular laterally; basal bead complete, very fine laterally, heavier medially. Elytra broadest about middle; striae not at all or only slightly grooved, formed by rows of pale to dark irregularly spaced fine punctures; subsutural interval broad, multipunctate anteriorly; other intervals of variable widths but all relatively narrow. Pygidium strongly, irregularly punctate.

Female.—11.5 mm, similar except antennal club heavier, about as long as stem; larger protarsal claws mixed, the left simple, the right broadly cleft; clypeus and front more roughly, irregularly punctate; pronotum with two small close-set antero-medial dark brown maculae.

Holotype and 4 male paratypes, CALIFORNIA, IMPERIAL CO., WINTERHAVEN, 3–4 April 1961, Maxwell, Collr. (CDA); Allotype and 2 male paratypes, Arizona, Yuma, 27 April 1962, 3 April 1961, 3 May 1962, Yanez, Mellor and Stedman, Collrs. (UAZ); 8 male paratypes, California, Imperial Co., Bard and Laguna Dam, 5 April to 3 May, Harrison, Akins, Miller and Cicero, Collrs. (CDA, Nelson and Cicero Colls.); 9 male paratypes, Arizona, Yuma Co., Laguna Dam and 5 mi. W Wellton, 10 Aug and 8 Oct, Nutting & Werner and Fisher, Collrs. (UAZ and Hardy Colls.); 1 male paratype, Arizona, Huachuca Mtns (USMNH); 1 female paratype, Arizona, Santa Catalina Mtns, Sabino Canyon, 17 May, Woods, Collr. (UAZ).

Holotype deposited at California Academy of Sciences, and allotype in University of Arizona Collection, on indefinite loan to California Academy of Sciences; paratypes in the collections of the above and California Department of Agriculture, U. S. Museum of Natural History, J. M. Cicero, Alan Hardy, H. F. Howden, G. H. Nelson and the author.

Paratypes vary from 8 to 11 mm. About half the males have transverse wrinkles on the clypeus, the others are strongly, irregularly punctate. The amount of dark maculation is variable, from almost none to very broadly margined and with the pair of small pronotal maculae, while the female has the pronotum immaculate. The female also has the larger claw of the protarsus broadly cleft, but all males have the claw simple.

***Anomala kanei*, new species**

Holotype male.—9 mm. Pale straw-colored, head and clypeus brown-black, pronotum with pair of small triangular anteromedial spots dark-brown, scutellum and elytra with extreme marginal edges red-brown and some clouding of brown inward from lateral margins. Beneath with short, not dense pilosity. Mesocoxal separation narrow. Protibiae strongly bidentate, terminal tooth long, slender, external tooth long, acute; larger protarsal claw strongly but finely cleft about middle; larger mesotarsal claw finely, deeply cleft well back from apex. Metatibia shorter

than femora, about as long as first 4 segments of tarsi but distinctly more than twice as long as width at apex. Antennal club much longer than stem, lamellae thin, somewhat twisted. Clypeus somewhat elongate, about twice as wide as long, sides subparallel toward base, very strongly and broadly reflexed to margins; anterior face strongly rounded under to porrect labrum; clypeofrontal suture deeply impressed in part; clypeus and front very irregularly rugulose and somewhat punctate, varying from large punctiform craters to small distinct punctures. Pronotum evenly arcuately rounded laterally, widest about middle, both anterior and posterior angles broadly rounded; moderately densely punctate, punctures shallow, fairly large; with faint indication of median line; basal bead distinct, entire. Elytra a little wider behind middle; striae broadly but not deeply impressed, with spaced, poorly defined strial punctures; entire discal surface with numerous micropunctures; subsutural interval distinctly widest but may be apparent only basally and apically as single row of large punctures forms substrate line at middle. Scutellum with slight posteromedian depression. Pygidium densely punctate, but punctures shallow, moderately large, irregular in shape and definition.

Female.—9 mm; very similar, differing primarily in sexual characters: antennal club about length of stem; protibial dentition still more acute and longer; larger protarsal claw almost evenly cleft with upper ramus a little smaller and shorter; larger mesotarsal claw with upper ramus a little larger and longer.

Holotype male, allotype, and 94 male paratypes, ARIZONA, COCONINO Co., 2 mi. S. MOENKOPI, 3 July 1972, Andrews and Kane, Collrs. (CDA); other paratypes from Arizona, Coconino Co.: 3 males, 2 mi. S. Moenkopi, 15 July, J. & L. Shepard, Collrs. (Hardy); 1 male, Kayenta, 23 July, Maehler, Collr. (Potts); 3 males, Tuba City, 1 July, 1 Aug, Allen, Cazier, Collrs. (CAS, CNC, and USMNH Colls.); and from Arizona, Navajo Co.; 7 males, 1 female, Aug, Duncan, Collr. (UAZ); 1 male, Winslow, 5 July, Johnston, Collr. (CNC); and 2 males, Utah, Kanab, 20 July, Knowlton and Harmston, Collrs. (USMNH).

Holotype and allotype, with paratypes in the collection of the California Academy of Sciences; paratypes also in the collections of the California Department of Agriculture, Canadian National Collection, University of Arizona, U. S. Museum of Natural History, Alan Hardy, and the author.

The male paratypes vary from 7 to 9 mm, with head and clypeal color varying from only a little darker than pale straw ground color through red-brown to brown-black, the pronotum sometimes becoming immaculate and elytral sculpture sometimes very shallow and faint. The female paratype is heavier, with darker ground color, but dark maculations paler.

This attractive small species, appearing closest to *antennata*, is named in memory of Fred Kane.

***Anomala sabinae*, new species**

Holotype male.—15 mm. Light straw-colored, with clypeus, head, and antero-medial pronotal macula red-brown, posterior margin of pronotum, lateral margins of scutellum and narrow sutural stripe of elytra brown-black. Beneath with moder-

ately short pilosity on thorax, abdomen almost glabrous. Mesocoxal separation narrow, but almost as wide as a tarsal segment. Protibiae strongly bidentate; larger protarsal claw strongly cleft with smaller ramus fine, slightly longer than larger ramus; larger mesotarsal claw with cleft nearly similar; metatibiae strongly surate and metatarsi exceptionally heavy as in *delicata*, about twice as wide as other tarsi. Antennal club slender, about as long as stem. Clypeus trapezoidal, more than twice as wide as long; sides strongly divergent; very narrowly reflexed at margins; anterior face distinctly oblique to exposed narrow portion of labrum; suture flat; front of head broad, rectangular; clypeus and front finely rugosely punctate. Pronotum widest at base with sides evenly arcuately narrowing to square anterior angles; posterior angles a little obtuse, slightly rounded, disc very finely, not densely punctured, punctures separated by 2-4 diameters, not becoming more coarsely nor more densely punctate at sides; basal bead obsolescent medially. Elytra broadest about posterior third; striae with distinct geminate pairs, the 3rd, 5th and 7th intervals very narrow, a little costate, and a similar 9th interval barely discernible; subsutural and other alternate intervals broad, multipunctate; striae punctures somewhat smaller than those of intervals, but all formed by a micropuncture in a pit. Pygidium very finely and densely, but shallowly strigulose.

Female.—14.5 mm; similar, however central pronotal macula complete to base, enclosing pale mediobasal area; pygidium not strigulose, but with very fine, shallow, laterally much elongated punctures, about 2-4 diameters apart; elytra with small dark spot over humeral umbone; other variation as normal for sex: tarsal claws more evenly cleft, protibiae more strongly dentate, antennal club heavier, but about as long as in male.

Holotype and allotype, ARIZONA, SANTA CATALINA MTNS., SABINO CANYON, in oak-mesquite-sycamore association along permanent stream, 2500', 26 July 1948, Werner & Nutting, Collrs. (UAZ). All paratypes, 28 males, 18 females, also from Sabino Canyon, various dates between 21 June and 4 September, Werner & Nutting, Butler, Johnson, Potts and Potts, Cicero, O'Brien, Hovore, Collrs. (UAZ, Potts, Cicero, Woodruff, Howden, and Carlson Colls.)

Holotype and allotype in the University of Arizona collection, on indefinite loan to the California Academy of Sciences, and paratypes in the collections of the Academy, as well as in the U. S. Museum of Natural History, University of Arizona, Carlson, Cicero, Hardy, Howden, Woodruff, and the author.

The paratypes vary between 13 and 17 mm. and sometimes become medium brown, the males usually with the pronotal macula antero-medial, rarely reaching to the base, while in the females the macula is almost always complete to base. Also, the males rarely show the dark macula over the humeral umbone, while it is usual in the female.

The species is very similar to, but consistently larger than *delicata*, and it has relatives of equal size in southern Mexico.

***Anomala suavis*, new species**

Holotype male.—8 mm. Pale straw-colored, with dark brown-black head and clypeus, pronotum with large central dark brown macula complete to basal margin,

scutellum and narrow entire margin of elytra dark brown. Moderately short pilose beneath. Mesocoxal separation narrow. Protibiae strongly bidentate, terminal tooth slenderly elongate, external tooth acute, longer than normal in genus; larger protarsal claws distinctly but finely cleft about middle; larger mesotarsal claws finely, deeply cleft well back from apex; metatibia notably short, shorter than femur, about length of first 4 segments of tarsus, only barely surate, but definitely more than twice as long as width at apex. Antennal club much longer than stem. Clypeus elongate, less than twice as wide as long, sides strongly convergent basally, strongly and broadly reflexed to margins; anterior face thick, strongly rounded under to small, slightly projecting anterior aspect of labrum; clypeofrontal suture slightly depressed; irregularly, finely rugosely punctate over clypeus and a small triangular area of front of head; head very finely punctate over vertex. Pronotum very evenly arcuately rounded laterally, widest behind middle; anterior angles obtuse but distinct; posterior angles very broadly rounded; with fine, shallow median line; discal punctures fine, not dense centrally but becoming more so laterally; basal bead not well-defined medially. Scutellum with distinct posteromedial depression. Elytra widest a little behind middle; striae irregularly, somewhat broadly impressed, with punctures often indistinct, fine to large; subsutural interval broadest, with scattered very large rough punctures becoming almost striate series at middle but not continuing to apex. Pygidium with scattered, shallow, irregular punctures.

Holotype and one male paratype, TEXAS, WINKLER CO., 4 mi. NE KERMIT, 5 June 1971, O'Brien and Marshall. Holotype on deposit at the California Academy of Sciences and paratype in the collection of the author.

Another of the species that is relatively close to *cavifrons*, but also another with well cleft protarsal claws, and the two known specimens are extremely clearly and neatly marked. In this respect they are quite unlike the usual *cavifrons* specimens that show some melanistic maculation.